SCORE Water Quality Information Sheet

Salinity – Salinity is the total amount of dissolved salts in water, expressed in grams of salt per kilogram of water (g/kg) or in parts per thousand (ppt). Salinity determines which animals and plants can live where as well as affecting other properties of water like dissolved oxygen and pH. The average salinity of the world oceans is 35 ppt. Salinity at our sites, which are primarily estuarine, normally ranges from 20-30 ppt. Salinity values are primarily influenced by precipitation and tidal cycles.

Dissolved Oxygen (DO) – Dissolved oxygen is a measure of the amount of oxygen freely available in water. It is commonly expressed as a concentration in terms of milligrams per liter (mg/L) or ppm. The DO for surface water ranges from 0 in extremely poor water conditions to a high of 10 mg/L in seawater (in fresh water levels can be higher than this). Water that is colder holds more oxygen; so does water that is lower in salinity. DO levels below 3 ppm are stressful to most aquatic organisms. DO levels below 1 ppm will not support fish; levels of 5 to 6 ppm are required for many fish. We routinely find dissolved oxygen values ranging from 4 mg/L to 8 mg/L.

pH – pH is a general measure of the acidity or alkalinity of a water sample. The pH of water, on a scale of 0 to 14, is a measure of the hydrogen ion concentration. PH 7.0 is neutral while values below that are acidic and values above that are basic. Because of the presence of many buffering ions, seawater is slightly basic, usually 8-8.2. However, the pH can vary with many factors, including salinity, so we would not be surprised to find pH values as low as 7.0 at our sites.

Temperature – Water temperature influences the organisms that live and reproduce in the water. The temperature of the water and air at our sites will vary greatly with the seasons. Temperature affects many of the other parameters we are measuring. For example, at high temperatures, dissolved oxygen levels are lower.

Turbidity – We use a secchi disk to estimate turbidity at our sites. The secchi disk provides a measure of the ***transparency*** of the water. Transparency can be affected by the color of the water, algae, and suspended sediments. Secchi disk readings are also affected by light conditions. Heavy rainfall, high winds, extreme tides, and algal blooms may all increase turbidity resulting in a lower Secchi disk reading. High turbidity is often associated with lowered dissolved oxygen and other adverse water conditions.

SCORE Water Monitoring Program

1. Pick up your water monitoring kit. Before departing, check to make sure the rinse bottle has water. Check that you have a functional pencil. Check that you have a blank water quality datasheet. If it is the last sheet, either make copies (if this is possible) or make a note to call us for more copies. If by some chance you are out of sheets, record the data on a blank sheet of paper.
2. When you get to the site, get out the notebook. Fill in the logsheet with date, time and your name. Select a blank water quality datasheet. Fill in the general information at the top, including weather observations. For the remaining steps, refer to the protocols in the notebook as needed.
3. Remove the thermometer from the bucket and record the air temperature. If the bucket has been stored where the temperature is significantly different from the outside air you may need to allow additional time for it to reach ambient temperature. Do not let it sit in the sun and do not hold it by the bulb end.
4. Remove the secchi disk from the bucket and take the turbidity measurement following the protocol. Remember to record both the disappearing and reappearing depths. If possible rinse the secchi disk with fresh water after use. Rewind the rope neatly around the disk.
5. Remove the sampling beaker and procure a water sample by gently submerging it. Remember to avoid splashing.
6. Set the thermometer in the beaker of water.
7. Remove the DO kit and get your DO sample (refer to protocols). After mixing set the ampoule inside the case and close the lid while the color develops.
8. Determine salinity with the refractometer. Rinse it before putting it away.
9. Check the calibration of the pH probe. Determine the pH of your sample (remember to remove the cap). Rinse the probe with fresh water before putting it away.
10. Record the water temperature.
11. Determine the dissolved oxygen. Dispose of the ampoule in the waste bottle. Make sure the color sample card is firmly seated in the box.
12. Repack all your equipment. Make a note of anything which needs replacing or calibrating.
13. If you know when you can come next mark it on the calendar in the front of the notebook.
14. Replace the notebook in its ziplock bag. Put the lid on the bucket. Return the bucket to the storage site.
15. Send us the data or enter it online.

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    Mail: Nancy Hadley
    Marine Resources
    PO Box 12559
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    Website: http://www.csc.noaa.gov/scoysters Select “Monitoring Data”
16. Notify us of any problems. Remember to let us know if you are running low on datasheets, DO ampoules, calibrating capsules or anything else.

    Nancy Hadley (843) 953-9841
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    Thanks for participating!! Remember you can view data from all the sites at our website.

pH Protocol (pHastchek brand)

Materials: pH pen (pHastchek brand)

Range: seawater generally has a pH of 8.0 - 8.4. You will probably see pH's in the range of 7.5-8.5.

Procedure: Complete instructions are included with the pen but are repeated here.

NOTES:

- Cap must be removed to take readings. It pulls straight off but it takes a surprising amount of force to do it.
- The tip only of the pH pen must be soaked in a small amount of freshwater before using or calibrating the pen. This is referred to as conditioning.
- Pen should not be immersed beyond the ridge against which the cap rests. This should be marked on the pen as the maximum immersion line.

Calibrate the pH pen if it has not been used in a week. To calibrate: Remove the cap and push the power button. The display should light. (If not, you may need to replace the batteries). Press cal – the display flashes 7.0c . Immerse pH pen in 7.0 PH standard until the c stops flashing (the 7.0 continues to flash). Remove pen and press val. Display flashes 4.0c. If you are planning to use 10.0pH buffer rather than 4.0pH buffer, press cal. The display should toggle to 10.0c. Immerse the probe (only to immersion line) in 4.0 or 10.0 pH standard until the c stops flashing (the 4.0 or 10.0 continues to flash). Press val. The pen is calibrated. Turn off power.

To make a measurement: Procure a water sample in a bottle or cup. Turn on the pH pen. Immerse the calibrated pH pen (no more than the marked immersion line). Stir gently. The display will flash until it equilibrates. When the display stops flashing record the reading.

If pen gives you an ERR message, it may need to be conditioned. Condition the pen by immersing it (not past max immersion line) in a shallow cup of tap water.

If pen gives you a suspicious reading (not within expected range), procure a sample for cross-reference to another probe. Recalibrate the probe and read again. Upon return to lab, read with a second probe. If both probes return the unusual reading, assume it is real. If readings are different with the 2 probes, check batteries. Do not use the suspect pen until the problem has been identified.

Clean the tip of the probe with freshwater after use. You can put a small piece of wet paper towel in the tip of the cap to help the probe remain moist while out of use.

pH Protocol (*Checker* brand pH pen)

Materials: pH pen (***Checker*** brand pH pen)

Range: seawater generally has a pH of 8.0 - 8.4. You will probably see pH's in the range of 7.5-8.5.

Procedure: Complete instructions are included with the pen but are repeated here.

NOTES:

- Cap must be removed to take readings.
- Do not be alarmed if white crystals appear around the cap. This is normal with the pH electrodes and they dissolve when rinsed with water.
- If the electrode is dry, soak it in the tap water for a few minutes, prior to use.
- Immerse the tip only of the pen into water, never immerse the electrode up to the connector. Always keep the connector clean and dry.

Calibrate the pH pen if it has not been used in a week. To calibrate: Dip the tip of the electrode (bottom 4cm/1 1/2") in a sample of pH 7.01 buffer at room temperature. Allow the reading to stabilize. Use a small screwdriver to adjust the pH 7 trimmer until the display reads "7.01". Rinse the electrode with water and dip it in a sample of pH 4.01 (or 10.01) buffer solution. Allow the reading to stabilize. With a small screwdriver adjust the pH 4/10 trimmer until the display read the chosen buffer value. Calibration is now complete. Always use fresh buffers for calibration.

Connect the electrode to the meter. Switch the Checker on. Remove the protective cap and immerse the tip of the electrode (bottom 4 cm/ 1 ½") into your sample. Stir gently and wait until the display stabilizes. After use, rinse the electrode with water to minimize contamination. Store buffer with a few drops of pH 7 solution in the protective cap. DO NOT use distilled or de-ionized water for storage purposes. Always replace the protective cap.

Dissolved Oxygen Protocol

CHEMets ampoules (DO Kit K-7512)
Sampling
The most important part of any dissolved oxygen test is sampling. A water sample should be obtained with minimal amount of mixing with air.

1. Rinse sampling cup with water to be sampled.
2. Submerge sampling cup well below surface of water (1-2 ft).
3. Pour off any water above the 25 ml mark.

Test Procedure

Caution: This test results in a sharp glass object which must be handled with care.

This is a colorimetric analysis in which a water sample is added to reagents and visually compared to color standards. Each color standard corresponds to a concentration of dissolved oxygen in parts per million (ppm, mg/L).

1. Insert the Chemets ampoule in the sample cup and place the tip of the ampoule between the wall of the sampling cup and plate at the bottom. Snap the tip by pressing the ampoule against the side of the cup. The ampoule will automatically fill, leaving a small bubble of air in the ampoule.
2. Mix the contents of the ampoule thoroughly by allowing the bubble to travel from end to end of the ampoule. Wipe all liquid from the side of the ampoule and wait 2 minutes to allow reagents to fully react with oxygen in water sample.
3. Standing directly beneath a bright source of light, hold the color comparator nearly horizontal and place the ampoule with water sample between the color standards until the best color match is found. The corresponding number to the color standard is the concentration of dissolved oxygen in ppm. If the color of the ampoule is between two color standards, a concentration estimate can be made between the two values of the color standards.
4. Retain ampoule with sample in kit and dispose used ampoule in lab.

Salinity Protocol (RHS-10ATC Portable / Handheld Refractometer)

Note: ATC stands for Built-in Automatic Temperature Compensation System

Refractometer Protocol

Refractometers are instruments used to measure the concentration of dissolved substances in liquid, such as the salt content in seawater, by applying the principle of light refraction. Light refraction is the “bending” effect that liquid has on light passing through it. As the concentration of dissolved substances increases, the “bending” effect also increases. Refractometers measure the amount of dissolved substances in liquids by measuring the refracted angle of light as it passes through the sample.

Refractometers are available in models calibrated to measure the concentration of different compounds. For measuring salinity, you must use a salinity refractometer.

Refractometers contain carefully aligned prisms and mirrors. It is very important to avoid dropping or jolting the refractometer which will cause misalignment.

Calibration:

1. Aim the front end of the refractometer to the direction of a bright light source, and adjust the eyepiece (focus adjustment) until the reticle scale can be sent clearly.
2. Open the daylight plate. Make sure that you are holding the refractometer horizontally or your sample will run off. Drop one or two drops of distilled water or R O water on the prism. Close the daylight plate and press it lightly, so the water spreads across the entire surface of the prism without any air bubbles or dry spots. Allow the sample to remain on the prism for about 30 seconds.
3. Point the refractometer towards the light source and look through the eyepiece. You will see a circular field with graduations down the center. The upper portion should be blue and with a white lower portion. If the field is not in focus, twist the eyepiece until the graduations are clearly distinguishable. Using distilled water, the boundary between blue and white portions should fall on the zero mark of the graduations. If not, turn the calibration screw on top of the refractometer until the boundary between the colors reaches the zero mark. The refractometer is now calibrated and ready to take a salinity measurement.

Sample measurement:

1. Collect sample of seawater and use the pipet to place 2-3 drops on the main prism. Close the daylight plate, making sure the sample spreads across the entire plate without any air bubbles or dry spots. Allow the sample to remain for 30 seconds before taking reading.
2. Point refractometer in direction of light source and look through the eyepiece. Many refractometers have 2 scales, a refractive index scale which typically goes from 1 to 1.07 and a salinity scale which goes from 0 to 100 parts per thousand (ppt or 0/00). Record the salinity in parts per thousand (ppt or 0/00) indicated by the boundary between blue and white portions of the field in the refractometer. Repeat with a second observer if desired.
3. When done, rinse prism with freshwater and pat dry with a clean cloth. DO NOT IMMERSE REFRACTOMETER IN WATER.

Turbidity / Water Clarity Protocol

Site Selection

Turbidity or water clarity is a measurement of how far down light penetrates into the water column. This indicates the amount of suspended particles such as plankton and or silt in the water. The deeper light penetrates into water (the clearer the water) the fewer particles are suspended in the water. A Secchi disk is a simple device for measuring water quality. It consists of a black and white disk attached to a rope which has been marked at measured intervals. The site where a Secchi reading is to be taken should be free from shade and in water where the bottom is not visible. Ideally, there should be little to no water current, the sky clear and sunny and readings should be made close to mid-day.

Procedure

1. Remove sunglasses.
2. Slowly lower the Secchi disc into the water in an area with full sunlight and no shade.
3. Secchi Disc depth recordings are made to the nearest 5 cm mark. Blue markings indicate 50 cm lengths while red markings indicate 5 cm lengths.
4. Record the depth in centimeters to where the Secchi disc just disappears from sight.
5. Raise the Secchi disc until the disc reappears and record this depth.
   (Tip: measuring the depth can be aided by marking with clothespins)
6. The Secchi depth is the **average** of these two depths. You may wish to repeat test with a second viewer.
7. Record depth of Secchi disc disappearance and reappearance, time of day, tide, current condition (strong, mild, or none), sky condition (clear, partly cloudy, or overcast), wind/wave condition (ripples, small waves, whitecaps), viewer's initials and any other significant notes.
8. Rinse Secchi disc and rope in freshwater and allow to dry.

Temperature Protocol

You will be provided with a thermometer for reading the air and water temperature for each site. Hold the thermometer at the top in the air for two minutes and record the temperature on the data sheet. Next, place the tip of the thermometer in the water for two minutes or until the reading stabilizes. Record this on the sheet. Rinse the thermometer in fresh water and dry before putting away.